CONTENTS OF VOLUME 109 · 1997

Oecologia

In Cooperation with the
International Association for Ecology (Intecol)

Editors in Chief

J.R. Ehleringer, Salt Lake City
C.H. Peterson, Morehead City
M. Schaefer, Göttingen
E.-D. Schulze, Bayreuth

Editorial Board

F. Bairlein, Wilhelmshaven
I. Baldwin, Buffalo
F.A. Bazzaz, Cambridge
J. Blondel, Montpellier
W.J. Bond, Rondebosch
D. Bowers, Bould
R. Brandl, Bad Lauchstädt
J.J. Burdon, Canberra
M.M. Caldwell, Logan
B. Casper, Philadelphia
P.D. Coley, Salt Lake City
M.J. Crawley, Ascot
T. Dawson, Ithaca
P.J. Den Boer, Wijster
P.R. Ehrlich, Stanford
G.D. Farquhar, Canberra
H.C.J. Godfray, Ascot
I. Hanski, Helsinki
H. Heilmeier, Tharandt
T. Hirose, Sendai
P. Högberg, Umeå
D. Hollinger, Durham
S. Jonasson, Copenhagen
P.M. Kareiva, Seattle
A. Knapp, Manhattan
C. Körner, Basel
S.L. Kohler, Champaign
O.L. Lange, Würzburg
J.H. Lawton, Ascot
S. McNaughton, Syracuse
D.B. Miles, Athens
R. Monson, Boulder
K. Nadelhoffer, Woods Hole
K. Nagy, Los Angeles
D. Neumann, Köln
R. Oren, Durham
C. Otto, Umeå
J.S. Pate, Nedland
R.W. Pearcy, Davis
S.L. Pimm, Knoxville
K. Reise, List
O. Sala, Buenos Aires
B. Schmid, Zürich
D. Simberloff, Tallahassee
M.L. Stanton, Davis
D.R. Strong, Bodega Bay
T. Tscharntke, Göttingen
S. Ulfstrand, Uppsala
M.J. Vanni, Oxford
P. Vitousek, Stanford
A. Watkinson, Norwich
T.C.R. White, Adelaide
W. Wieser, Innsbruck
D.H. Wise, Lexington
V. Wolters, Giessen
H. Ziegler, München
H. Zwölfer, Bayreuth

Springer

Oecologia

Derived from *"Zeitschrift für Morphologie und Ökologie der Tiere", Oecologia* was founded in 1968, volumes (1968–1982), and edited by H. Remmert. As of volume 53 (1982) the journal has been edited by both H. Remmert and E.-D. Schulze. As of volume 81 (1989) the journal has been edited by J.R. Ehleringer, Salt Lake City; C.H. Peterson, Morehead City; H. Remmert, Marburg; E.-D. Schulze, Bayreuth. As of volume 83 (1990) the journal has been edited by J.R. Ehleringer, Salt Lake City; C.H. Peterson, Morehead City; M. Schaefer, Göttingen; E.-D. Schulze, Bayreuth.

Copyright

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), all translation rights as well as the rights to publish the article in any electronic form. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

The Canada Institute for Scientific and Technical Information (CISTI) provides a comprehensive, world-wide document delivery service for all Springer-Verlag journals. For more information, or to place an order for a copyright-cleared Springer-Verlag document, please contact Client Assistant, Document Delivery, Canada Institute for Scientific and Technical Information, Ottawa K1A OS2, Canada (Tel: 613-993-9251; FAX: 613-952-8243; e-mail: cisti.docdel@nrc.-ca).

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors, the editors, nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Special regulations for photocopies in the USA: Photocopies may be made for personal or in-house use beyond the limitations stipulated under Section 107 or 108 of U.S. Copyright Law, provided a fee is paid. All fees should be paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0029-8549, the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copying for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher.

This journal is included in the Springer Journals Preview Service, i.e. the tables of contents and BiblioAbstracts are available via Internet before the new issue reaches the subscribers. Tables of contents are free of charge; BiblioAbstracts are available for a small annual fee. Details can be obtained by sending an e-mail message containing the line help to svjps@springer.de.

Printers:

Universitätsdruckerei H. Stürtz AG, Würzburg

© Springer-Verlag Berlin Heidelberg 1997

Springer-Verlag GmbH & Co. KG, D-14197 Berlin, Germany

Printed in Germany

Springer

Contents

Adams III WW → Barker DH
Alonso-Pimentel H → Papaj DR
Andersen R, Linnell JDC: Variation in maternal investment in a small cervid: the effects of cohort, sex, litter size and time of birth in roe deer (*Capreolus capreolus*) fawns 74
Anderson MJ, Underwood AJ: Effects of gastropod grazers on recruitment and succession of an estuarine assemblage: a multivariate and univariate approach 442
Antolin MF → Ode P J
Arntz AM → Zangerl AR
Atkinson RPD → Macdonald DW

Baker RL, Smith BP: Conflict between antipredator and antiparasite behaviour in larval damselflies 622
Barker DH, Adams III WW: The xanthophyll cycle and energy dissipation in differently oriented faces of the cactus *Opuntia macrorhiza* 353
Bassow SL, Bazzaz FA: Intra- and interspecific variation in canopy photosynthesis in a mixed deciduous forest 507
Bazzaz FA → Bassow SL
Bazzaz FA → Hughes L
Berenbaum MR → Zangerl AR
Berry SC, Varney GT, Flanagan LB: Leaf $\delta^{13}C$ in *Pinus resinosa* trees and understory plants: variation associated with light and CO_2 gradients 499
Blanchard G → Macdonald DW
Blanckenhorn WU: Altitudinal life history variation in the dung flies *Scathophaga stercoraria* and *Sepsis cynipsea* 342
Blum JD → Chamberlain CP
Bollmann K → Brodmann PA
Bond WJ → Johnson SD
Bosch J, Retana J, Cerdá X: Flowering phenology, floral traits and pollinator composition in a herbaceous Mediterranean plant community 583
Brendelberger H: Determination of digestive enzyme kinetics: a new method to define trophic niches in freshwater snails 34
Brodmann PA, Reyer H-U, Bollmann K, Schläpfer AR, Rauter C: The importance of food quantity and quality for reproductive performance in alpine water pipits (*Anthus spinoletta*) 200
Brown VK → Ganade G

Caldwell MM → Cui M
Caouette M → Cobb NS
Carruthers TJB, Walker DI: Light climate and energy flow in the seagrass canopy of *Amphibolis griffithii* (J.M. Black) den Hartog 335
Cerdá X → Bosch J
Chamberlain CP, Blum JD, Holmes RT, Feng X, Sherry TW, Graves GR: The use of isotope tracers for identifying populations of migratory birds 132
Chapin III FS → Hungate BA
Christensen KM → Cobb NS
Cobb NS, Mopper S, Gehring CA, Caouette M, Christensen KM, Whitham TG: Increased moth herbivory associated with environmental stress of pinyon pine at local and reginal levels 389
Colunga-Garcia M → Ostrom PH
Conover DO → Schultz ET
Contreras LC → Gutiérrez JR
Contreras O → Lusk CH
Cork SJ → Lawler IR
Corp N, Gorman ML, Speakman JR: Ranging behaviour and time budgets of male wood mice *Apodemus sylvaticus* in different habitats and seasons 242
Corti D, Kohler SL, Sparks RE: Effects of hydroperiod and predation on a Mississippi River floodplain invertebrate community 154
Cui M, Caldwell MM: Shading reduces exploitation of soil nitrate and phosphate by *Agropyron desertorum* and *Artemisia tridentata* from soils with patchy and uniform nutrient distributions 177

Dawson TE → Geber MA
Dearing MD: Effects of *Acomastylis rossii* tannins on a mammalian herbivore, the North American pika, *Ochotona princeps* 122
Dunson WA → Paradise CJ

Ehleringer JR → Sparks JP
Erickson KS, Morse DH: Predator size and the suitability of a common prey 608
Esseen P-A → Renhorn K-E
Esseen P-A → Sundberg B
Estiarte M → Peñuelas J
Eubanks MD, Nesci KA, Petersen MK, Liu Z, Sanchez HB: The exploitation of an ant-defended host plant by a shelter-building herbivore 454

Feist MA → Pellmyr O
Feng X → Chamberlain CP
Field CB → Hungate BA
Figueroa J → Lusk CH
Flanagan LB → Berry SC
Floyd T → Orians CM
Foley WJ → Lawler IR

Gage SH → Ostrom PH
Ganade G, Brown VK: Effects of belowground insects, mycorrhizal fungi and soil fertility on the establishment of *Vicia* in grassland communities 374
Gaugler R, Lewis E, Stuart RJ: Ecology in the service of biological control: the case of entomopathogenic nematodes 483
Geber MA, Dawson TE: Genetic variation in stomatal and biochemical limitations to photosynthesis in the annual plant, *Polygonum arenastrum* 535
Gehring CA → Cobb NS
Gordon DM, Wagner D: Neighborhood density and reproductive potential in harvester ants 556
Gorman ML → Corp N
Goulson D: *Wipfelkrankheit*: modification of host behaviour during baculoviral infection 219
Graves GR → Chamberlain CP
Greatorex-Davies JN → Sutcliffe OL
Grimm V, Wissel C: Babel, or the ecological stability discussions: an inventory and analysis of terminology and a guide for avoiding confusion 323
Gutiérrez JR, Meserve PL, Herrera S, Contreras LC, Jaksic FM: Effects of small mammals and vertebrate predators on vegetation in the Chilean semiarid zone 398

Halaj J, Ross DW, Moldenke AR: Negative effects of ant foraging on spiders in Douglas-fir canopies 313
Hamrick JL → Pellmyr O
Haukioja E → Zvereva EL
Heaton THE, Spiro B, Robertson SMC: Potential canopy influences on the isotopic composition of nitrogen and sulphur in atmospheric deposition 600
Herrera S → Gutiérrez JR
Hjältén J: Willow hybrids and herbivory: a test of hypotheses of phytophage response to hybrid plants using the generalist leaf-feeder *Lochmaea caprea* (Chrysomelidae) 571
Hobson KA, Wassenaar LI: Linking breeding and wintering grounds of neotropical migrant songbirds using stable hydrogen isotopic analysis of feathers 142
Holland EA → Hungate BA
Holmes RT → Chamberlain CP
Horn MH: Evidence for dispersal of fig seeds by the fruit-eating characid fish *Brycon guatemalensis* Regan in a Costa Rican tropical rain forest 259
Hughes L, Bazzaz FA: Effect of elevated CO_2 on interactions between the western flower thrips, *Frankliniella occidentalis* (Thysanoptera: Thripidae) and the common milkweed, *Asclepias syriaca* 286
Hungate BA, Chapin III FS, Zhong H, Holland EA, Field CB: Stimulation of grassland nitrogen cycling under carbon dioxide enrichment 149

Isbell LA → Young TP

Jaksic FM → Gutiérrez JR
Jennings JG, Steinberg PD: Phlorotannins versus other factors affecting epiphyte abundance on the kelp *Ecklonia radiata* 461
Johnson SD, Bond WJ: Evidence for widespread pollen limitation of fruiting success in Cape wildflowers 530

Kennish R: Seasonal patterns of food availability: influences on the reproductive output and body condition of the herbivorous crab *Grapsus albolineatus* 209
Kitajima K, Mulkey SS, Wright SJ: Seasonal leaf phenotypes in the canopy of a tropical dry forest: photosynthetic characteristics and associated traits 490
Kohler SL → Corti D
Kozlov MV → Zvereva EL

Larson KC, Whitham TG: Competition between gall aphids and natural plant sinks:

plant architecture affects resistance to galling 575
Latta RG, Linhart YB: Path analysis of natural selection on plant chemistry: the xylem resin of ponderosa pine 251
Lawler IR, Foley WJ, Woodrow IE, Cork SJ: The effects of elevated CO_2 atmospheres on the nutritional quality of *Eucalyptus* foliage and its interaction with soil nutrient and light availability 59
Leibold MA → Tessier AJ
Leimberger JD → McCollum SA
Lewis E → Gaugler R
Linhart YB → Latta RG
Linnell JDC → Andersen R
Linsenmair KE → Spieler M
Liu Z → Eubanks MD
Lowenberg GJ: Effects of floral herbivory, limited pollination, and intrinsic plant characteristics on phenotypic gender in *Sanicula arctopoides* 279
Lusk CH, Contreras O, Figueroa J: Growth, biomass allocation and plant nitrogen concentration in Chilean temperate rainforest tree seedlings: effects of nutrient availability 49

Macdonald DW, Atkinson RPD, Blanchard G: Spatial and temporal patterns in the activity of European moles 88
Massey LK → Pellmyr O
McCollum SA, Leimberger JD: Predator-induced morphological changes in an amphibian: predation by dragonflies affects tadpole shape and color 615
McGuinness KA: Dispersal, establishment and survival of *Ceriops tagal* propagules in a north Australian mangrove forest 80
Megonigal JP → Tissue DT
Meserve PL → Gutiérrez JR
Mitchell RJ: Effects of pollination intensity on *Lesquerella fendleri* seed set: variation among plants 382
Moldenke AR → Halaj J
Mopper S → Cobb NS
Morse DH → Erickson KS
Mulkey SS → Kitajima K

Nesci KA → Eubanks MD
Niemelä P → Zvereva EL
Nilsson M-C → Wardle DA

Ode P J, Antolin MF, Strand MR: Constrained oviposition and female-biased sex allocation in a parasitic wasp 547
Olsen KM: Pollination effectiveness and pollinator importance in a population of *Heterotheca subaxillaris* (Asteraceae) 114
Orians CM, Floyd T: The susceptibility of parental and hybrid willows to plant enemies under contrasting soil nutrient conditions 407
Ostrom PH, Colunga-Garcia M, Gage SH: Establishing pathways of energy flow for insect predators using stable isotope ratios: field and laboratory evidence 108

Palmqvist K → Renhorn K-E
Palmqvist K → Sundberg B
Papaj DR, Alonso-Pimentel H: Why walnut flies superparasitize: time savings as a possible explanation 166
Paradise CJ, Dunson WA: Insect species interactions and resource effects in treeholes: are helodid beetles bottom-up facilitators of midge populations? 303
Peggie D → Sutcliffe OL
Pellmyr O, Massey LK, Hamrick JL, Feist MA: Genetic consequences of specialization: yucca moth behavior and self-pollination in yuccas 273
Peñuelas J, Estiarte M: Trends in plant carbon concentration and plant demand for N throughout this century 69
Petersen MK → Eubanks MD
Pockman WT, Sperry JS: Freezing-induced xylem cavitation and the northern limit of *Larrea tridentata* 19
Press MC → Scholes JD

Raguso RA → Roy BA
Rauter C → Brodmann PA
Renhorn K-E, Esseen P-A, Palmqvist K, Sundberg B: Growth and vitality of epiphytic lichens I. Responses to microclimate along a forest edge-interior gradient 1
Renhorn-K-E → Sundberg B
Retana J → Bosch J
Reyer H-U → Brodmann PA
Robertson SMC → Heaton THE
Ross DW → Halaj J
Roy BA, Raguso RA: Olfactory versus visual cues in a floral mimicry system 414

Sadras VO: Interference among cotton neighbours after differential reproductive damage 427
Sanchez HB → Eubanks MD
Sandsten H → Weisner SEB
Schläpfer AR → Brodmann PA
Scholes JD, Press MC, Zipperlen SW: Differences in light energy utilisation and dissipation between dipterocarp rain forest tree seedlings 41
Schultz ET, Conover DO: Latitudinal differences in somatic energy storage: adaptive responses to seasonality in an estuarine fish (Atherinidae: *Menidia menidia*) 516
Sherry TW → Chamberlain CP
Smith BP → Baker RL
Sparks JP, Ehleringer JR: Leaf carbon isotope discrimination and nitrogen content for riparian trees along elevational transects 362
Sparks RE → Corti D
Speakman JR → Corp N
Sperry JS → Pockman WT
Spieler M, Linsenmair KE: Choice of optimal oviposition sites by *Hoplobatrachus occipitalis* (Anura: Ranidae) in an unpredictable and patchy environment 184
Spiro B → Heaton THE
Stamp NE → Traugott MS
Steffan-Dewenter I, Tscharntke T: Early succession of butterfly and plant communities on set-aside fields 294
Steinberg PD → Jennings JG
Strand JA → Weisner SEB
Strand MR → Ode P J
Stuart RJ → Gaugler R
Stubblefield CH → Young TP
Sundberg B, Palmqvist K, Esseen P-A, Renhorn-K-E: Growth and vitality of epiphytic lichens II. Modelling of carbon gain using field and laboratory data 10
Sundberg B → Renhorn K-E
Sutcliffe OL, Thomas CD, Peggie D: Area-dependent migration by ringlet butterflies generates a mixture of patchy population and metapopulation attributes 229
Sutcliffe OL, Thomas CD, Yates TJ, Greatorex-Davies JN: Correlated extinctions, colonizations and population fluctuations in a highly connected ringlet butterfly metapopulation 235

Tessier AJ, Leibold MA: Habitat use and ecological specialization with lake *Daphnia* populations 561
Thomas CD → Sutcliffe OL
Thomas RB → Tissue DT
Tissue DT, Megonigal JP, Thomas RB: Nitrogenase activity and N_2 fixation are stimulated by elevated CO_2 in a tropical N_2-fixing tree 28
Traugott MS, Stamp NE: Effects of chlorogenic acid- and tomatine-fed caterpillars on performance of an insect predator 265
Tscharntke T → Steffan-Dewenter I

Underwood AJ → Anderson MJ

Varney GT → Berry SC

Wagner D → Gordon DM
Wagner JD, Wise DH: Influence of prey availability and conspecifics on patch quality for a cannibalistic forager: laboratory experiments with the wolf spider *Schizocosa* 474
Walker DI → Carruthers TJB
Wardle DA, Nilsson M-C: Microbe-plant competition, allelopathy and arctic plants 291
Wassenaar LI → Hobson KA
Weisner SEB, Strand JA, Sandsten H: Mechanisms regulating abundance of submerged vegetation in shallow eutrophic lakes 592
Whitham TG → Cobb NS
Whitham TG → Larson KC
Wise DH → Wagner JD
Wissel C → Grimm V
Woodrow IE → Lawler IR
Wright SJ → Kitajima K

Yates TJ → Sutcliffe OL
Young TP, Stubblefield CH, Isbell LA: Ants on swollen-thorn acacias: species coexistence in a simple system 98

Zangerl AR, Arntz AM, Berenbaum MR: Physiological price of an induced chemical defense: photosynthesis, respiration, biosynthesis, and growth 433
Zhong H → Hungate BA
Zipperlen SW → Scholes JD
Zvereva EL, Kozlov MV, Niemelä P, Haukioja E: Delayed induced resistance and increase in leaf fluctuating asymmetry as responses of *Salix borealis* to insect herbivory 368

Indexed in *Current Contents*